MTT-2001

Ultra-Linear Power Amplifier Characterization Using Dynamic Range Extension Techniques

Roland Hassun and Nicholas Kuhn, Agilent Technologies

Richard Posner, Richard Sweeney and Bill Vassilakis, Powerwave Technologies

Abstract **— The rapid growth of the wireless industry requires more efficient utilization of the available frequency spectrum. This has resulted in requirements for highly linear Multi-Channel Power Amplifiers (MCPAs) to support increases in voice and data traffic. To characterize the resulting ultra-linear MCPAs and to comply with inter-modulation levels less than -80 dBc requires measurement systems with dynamic range performance beyond what is currently available. A new instrument, which extends the dynamic range of current distortion measurement systems by at least 25 dB, has been developed to meet this challenge.**

I. Introduction

Significant modulation format changes are on the way for wireless systems evolving to 3G. The goal of these format changes is to enable efficient data access over the wireless networks and to increase utilization of wireless communication for data as well as voice. Efficient data access requires enhanced air interface data rates and the European Telecommunications Standards Institute (ETSI) has set new standards for GSM, EDGE, and W-CDMA. EDGE (Enhanced Data rates for Global Evolution) moves GSM from GMSK to 8-PSK modulation, which increases the Peak to Average power Ratio (PAR) and significantly increases the linearity requirements of current GSM amplifier systems -- especially where multiple carriers are employed.

Table 1 summarizes the in-band spectral requirements for transmission of these signals in accordance with European Spectral requirements. For offsets > than 6 MHz from the carrier, spurious emission within a 100 kHz bandwidth must be less than –70 dBc relative to the carrier power in the same bandwidth. This is measured using a peak hold setting on the spectrum analyzer, which is equivalent to about –80 dBc when using averaging.

Table 1
Intra Base Station System Intermodulation Requirements

Power Level (dBm)	Maximum relative level (dB) at specified carrier offsets (kHz)			
	RBW & VBW: 30kHz, Averaging over 200 sweeps.		RBW & VBW: 100kHz, Averaging over 200 sweeps.	RBW: 300kHz, Detector: Max Hold
	600 to 1200	1200 to 1800	1800 to 6000	> 6000
>= 43	-70	-73	-75	-70
41	-68	-68	-73	-70
39	-66	-66	-71	-70
37	-64	-64	-69	-70
35	-62	-62	-67	-70
<= 33	-60	-60	-65	-70

Table 1. Relative spurious emission mask requirements for transmission of GSM and/or EDGE signals in a MCPA in accordance with European spectral standards (GSM 11.21 version 7.2.0 Release 1998)
Table 2. Spectral Mask requirements for 3GPP amplifiers